FAU

FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Undergraduate Programs

Department HC- Biology

College Wilkes Honors College

*(To obtain a course number, contact **erudolph@fau.edu**)*

UUPC Approval 11-03-25
UFS Approval _____
SCNS Submittal _____
Confirmed _____
Banner Posted _____
Catalog _____

Prefix PCB

Number 3850

(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)

Lab Code C

Type of Course Lecture/Lab

Course Title Hon Neurobiology Imaging

Credits *(See Definition of a Credit Hour)* 3

Effective Date *(TERM & YEAR)* Fall 2026

Grading *(Select One Option)*

Regular (●)

Sat/UnSat ( )

Course Description *(Syllabus must be attached; see Template and Guidelines)*
This course studies central nervous system homeostasis and age-related degeneration. As a course-based undergraduate research experience (CURE), students will perform novel research projects that will 1) strengthen experimental design, scientific writing, and communication skills, 2) learn advanced cellular neuroscience techniques including tissue dissection, IHC, confocal imaging, image analysis, and statistical analysis, and 3) use a practical approach to formalize current neuroscience conceptual knowledge on the subject of aging and neurological dysfunction.

Prerequisites, with minimum grade* None

Corequisites None

Registration Controls *(Major, College, Level)* Honors College

Default minimum passing grade is D-. Prereqs., Coreqs. & Reg. Controls are enforced for all sections of course

WAC/Gordon Rule Course

☐ **Yes** ☑ **No**

WAC/Gordon Rule criteria must be indicated in syllabus and approval attached to proposal. See WAC Guidelines.

Intellectual Foundations Program (General Education) Requirement *(Select One Option)*

None

General Education criteria must be indicated in the syllabus and approval attached to the proposal. See Intellectual Foundations Guidelines.

Minimum qualifications to teach course

Ph.D. in Neuroscience, Biology, or a related field.

Faculty Contact/Email/Phone

Casey Spencer/Cspenc27@fau.edu/5617998555

List/Attach comments from departments affected by new course

CoS Biology Department

Approved by	***Date***
Department Chair Tanya Mus	10/24/25
College Curriculum Chair Terje Hill	10-24-2025
College Dean	10/24/25
UUPC Chair Korey Sorge	11-03-25
Undergraduate Studies Dean Dan Meeroff	11-03-25
UFS President	
Provost	

Email this form and syllabus to mjenning@fau.edu seven business days before the UUPC meeting.

PCB 3850C
Hon Neurobiology Imaging
M- 4-5:50pm, F- 11:00-12:50pm; EC 105
3 credits
Fall 2026
Professor: Dr. Casey Spencer
Email: Cspenc27@fau.edu
Office location: RE 106
Office hours: T/Th 1-3pm

Graduate TA: Allison Walsh
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Undergraduate TA Volunteer: Panteha Sartipi
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Course description

This course studies central nervous system homeostasis and age-related degeneration. As a course-based undergraduate research experience (CURE), students will perform novel research projects that will 1) strengthen experimental design, scientific writing, and communication skills, 2) learn advanced cellular neuroscience techniques including tissue dissection, IHC, confocal imaging, image analysis, and statistical analysis, and 3) use a practical approach to formalize current neuroscience conceptual knowledge on the subject of aging and neurological dysfunction.

Note of Honors Distinction
This course differs substantially from a non-Honors version. First, and most importantly, the course is an agreement between the student and instructor that they will work together collaboratively to ensure a significantly enriched learning experience in a manner consistent with other Honors-designated courses at FAU. This means the course will produce substantive work that reflects interdisciplinarity and connections among academic fields, research and direct access to sources of knowledge pertinent to the field, leadership, creative and critical thinking, and engagement with the world outside the university. Secondly, the writing component of the course will be much more demanding and will prepare students for upper-division college writing and for work on the Honors Thesis.

Instructional Method
In-Person. There is no remote option for this course.

Anything covered on this syllabus is subject to change, and those changes will be announced through Canvas. Enable all notifications in Canvas so you receive announcements related to this course. Students are also required to check their FAU e-mail regularly. If you have any technical

issues or questions about Canvas or other technical issues, be sure to contact OIT (http://www.fau.edu/oit/index.php). The instructor cannot provide tech support.

PowerPoints and other readings will be posted to Canvas.

Please note that in the unlikely event that a portion of the course must temporarily be moved online (for example, if the instructor is isolating/quarantined and temporarily cannot teach in person or if changes are mandated by the university), Zoom would be used as the videoconferencing tool for the course. As such, students should have a computer and reliable internet access to access materials in Canvas (and Zoom if needed).

Prerequisites
None

Writing course component
Students will also compose an independent research project proposal. Students will receive feedback on their project proposal, experimental design, and significance of their results from their peers, TAs, and professor. Students will conduct a literature review, experimental design, and an independent project proposal. Students will compose a formal written report in the format of a scientific proposal and a poster presentation. Posters will be used to present student independent projects at symposia. Experimental findings have the potential to be written up as a manuscript for publication in a peer-reviewed publication.
For all co-authored assignments, students will be required to submit an assessment of individual student contributions. This will be used for grading purposes and individual student contribution will contribute to individual student grades on a particular assignment.

Course Objectives
In completing this course, students will use Drosophila melanogaster as a model to:

- Develop an understanding of neuroanatomy and circuit function in the CNS of the fly as a model system.
- Learn about age-related circuit dysfunction, oxidative damage, mitochondrial function, and memory.
- Develop practical laboratory skills such as literature reviews, genetic crosses, nervous system dissection, immunohistochemistry, confocal microscopy, analysis, statistics, and more.
- Use the scientific process to develop novel research projects, collect data, and communicate findings at the end of the semester.
- Hone their written and verbal scientific communication skills through data presentation, discussions, and a formal research paper.

Grading-

Quizzes: 5x (10 points each)	50 points
Literature analysis:	25 points

Literature review:	100 points
Progression (lab technique) assessments: 5x (5 points each)	25 points
Lab practical:	50 points
Data/statistical analysis:	25 points
Paper draft 1:	25 points
Paper draft 2:	50 points
Final paper:	100 points
Poster draft:	50 points
Final poster w/ presentation:	100 points
Attendance/participation:	50 points

Total: 650 points

GRADING SCALE:

Grade	Percentage (%)
A	>93%
A-	>90% - 93%
B+	>87% - 90%
B	>83% - 87%
B-	>80% - 83%
C+	>77% - 80%
C	>73% - 77%
C-	>70% - 73%
D+	>67% - 70%
D	>63% - 67%
D-	>60% - 63%
F	<60%

Policy on Makeup Tests, Late Work, and Incompletes

Make-up exams or research discussion activities will be given only if the student contacts the instructor either before the exam or discussion activity or within 48 hours after the exam or discussion activity and arranges to provide appropriate documentation (such as a doctor's note,

e-mail advisory from Student Health, a walk-in clinic, etc. to isolate, etc.). DO NOT COME TO CLASS if you are feeling ill. You have the opportunity contact student health, go to a walk-in clinic (there are two right near campus) or other doctor's office, and/or schedule a telehealth appointment with SHS or another clinic if you feel ill and need documentation, so there are many options available to you to get appropriate documentation. If you miss a lecture due to illness, the class materials will be posted to Canvas, and I'd be happy to discuss the material with you by appointment during office hours if you have questions about what you missed.

Assignments: Assignments, including preparatory assignments, are due by the due date. 10% deduction per day for 5 days for late submissions. No submissions accepted after 5 days.

Please remember that even though the clinic on the Jupiter campus is only open a few days per week, you can call the MAIN SHS number 561-297-3512 during business hours on weekdays for assistance or to request a telehealth appointment.

Please contact the instructor if you have questions or concerns about your specific situation. If a conflict (such as a medical school interview) is known in advance, please contact your instructor immediately with a written excuse, and alternate plans may be arranged. Reasonable accommodation will be made for students participating in a religious observance. Please note that scheduled vacations are not a valid reason for an excused absence. If a student is unable to complete the required coursework for health or family reasons, an 'incomplete' may be issued for the course following approval. Note that an incomplete cannot be given to students who have less than a C- in the course.

The University policy states that a student who is passing a course but has not completed all work due to exceptional circumstances, may, with consent of the instructor, temporarily receive a grade of incomplete ("I"). The assignment of the "I" grade is at the discretion of the instructor but is allowed only if the student is passing the course with a C- or better.

Classroom Etiquette Policy

Disruptive behavior is defined in the FAU Student Code of Conduct as "... activities which interfere with the educational mission within classroom." Students who disrupt the educational experiences of other students and/or the instructor's course objectives in a face-to-face or online course are subject to disciplinary action. Such behavior impedes students' ability to learn or an instructor's ability to teach. Disruptive behavior may include but is not limited to non-approved use of electronic devices (including cellular telephones); cursing or shouting at others in such a way as to be disruptive; or, other violations of an instructor's expectations for classroom and online conduct.
For more information, please see the FAU Office of Student Conduct.

Policy on the Recording of Lectures

Students enrolled in this course may record video or audio of class lectures *for their own personal educational use.* A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach students about a particular subject. *Recording class activities other than class lectures, including but not limited to student presentations (whether individually or as part of a group), class discussion (except when*

incidental to and incorporated within a class lecture), labs, clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, and private conversations between students in the class or between a student and the lecturer, is prohibited. Recordings may not be used as a substitute for class participation or class attendance and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the University's Student Code of Conduct and/or the Code of Academic Integrity.

Attendance Policy

Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University-approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence.

AI Flexible: The use of AI to assist in work assigned in this specific course is permitted only for specific assignments as indicated by the instructor. Use must be properly documented and cited per instructor guidelines (https://fau.edu/ai/citation).

Students are encouraged to use AI platforms like ChatGPT for brainstorming and learning general information to develop project ideas to further investigate. Students may use Perplexity AI or other resources to find relevant peer-reviewed sources of information in addition to traditional repositories like PubMed. Students are not permitted to copy and paste any of the information provided by the AI platform in their reports or assignments unless explicitly stated in the assignment instructions. Using AI generated text in your assignments and representing it as your own is plagiarism and is not allowed in any situation.

Counseling and Psychological Services (CAPS) Center

Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to http://www.fau.edu/counseling/

Disability Policy

In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at www.fau.edu/sas/.

Code of Academic Integrity

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001.

Plagiarism is unacceptable in the University community. Academic work must be an original work of your own thought, research, or self-expression. When students borrow ideas, wording, or organization from another source, they must acknowledge that fact in an appropriate manner. Plagiarism is the deliberate use and appropriation of another's work without identifying the source and trying to pass off such work as one's own. Any student who fails to give full credit for ideas or materials taken from another has plagiarized. If in doubt, cite your source.

Wilkes Honors College Honor Code: All students agree to adhere to the honors code, available online at: http://www.fau.edu/honors/academics/honor-code.php

Required Texts/Readings

Literature:

Southall TD, Elliott DA, Brand AH. The GAL4 System: A Versatile Toolkit for Gene Expression in Drosophila. CSH Protoc. 2008 Jul 1;2008:pdb.top49. doi: 10.1101/pdb.top49. PMID: 21356876.

Davis RL. Learning and memory using Drosophila melanogaster: a focus on advances made in the fifth decade of research. Genetics. 2023 Aug 9;224(4):iyad085. doi: 10.1093/genetics/iyad085. PMID: 37212449; PMCID: PMC10411608.

Coutinho-Budd J, Freeman MR, Ackerman S. Glial Regulation of Circuit Wiring, Firing, and Expiring in the *Drosophila* Central Nervous System. Cold Spring Harb Perspect Biol. 2024 Dec 2;16(12):a041347. doi: 10.1101/cshperspect.a041347. PMID: 38565270; PMCID: PMC11513168.

Fei L, Liang Y, Kintscher U, Sigrist SJ. Coupling of mitochondrial state with active zone plasticity in early brain aging. Redox Biol. 2025 Feb;79:103454. doi: 10.1016/j.redox.2024.103454. Epub 2024 Dec 3. PMID: 39642596; PMCID: PMC11666929.

Additional literature to support research projects will be provided throughout the semester.

Powerpoint slides and additional materials, such as activities, review sheets, and research articles will be posted to Canvas. A "Resources" module will contain helpful material including resources to support students, and as the semester progresses, it will be updated with information on scholarships, research, scientific lectures, and other professional development opportunities. I will review the use of Canvas and expectations for the course with you during the first day of class.

Time Commitment per Credit Hour

This course has 3 credit hours. For traditionally delivered courses, one (1) hour of classroom or direct faculty instruction each week for fifteen (15) weeks per Fall or Spring semester, and a minimum of two (2) hours of out-of-class student work per week (including reading and studying) is expected *for each credit hour*. Equivalent time and effort are required for Summer Semesters, which usually have a shortened time frame. Fully Online courses, hybrid, shortened, intensive format courses, and other non-traditional modes of delivery will demonstrate equivalent time and effort.

Course Communication Policy

EXPECTATIONS FOR STUDENTS

Announcements/e-mail

You are responsible for reading all announcements and e-mails sent by the instructor. Check the course announcements each time you log in. You are responsible for reading all your course email and responding in a timely manner. Be sure to set up notifications in Canvas so that you receive all notifications for the course. Students should use check their FAU e-mail regularly and use that e-mail address when communicating with the instructor. **Always use your FAU e-mail account or Canvas to e-mail me – do not use other accounts, such as your personal g-mail account.**

Electronic Communication Policy

In addition to the University's policy, please consider the following:

- Privacy, confidentiality, and security in all electronic communications.
- All electronic communication resources must be used for the course and in alignment with to the University mission.

- Prohibited use of false identity, false identity pseudonyms, or anonymous (sender's name or electronic identification is hidden).
- Access without consent, disruption of services including introducing computer contaminants (viruses), and harassment of any kind are prohibited

Please see the Office of Information Technology's policies on Cyber Security Awareness.

Office hours: See the first page of the syllabus for office hours. I encourage students to see me during office hours with any questions or concerns. Appointments are strongly recommended. If your class schedule prevents you from meeting during my posted office hours, let me know, and I will do my best to work something out.

Additional time spent in the research lab will be allocated with request. A TA or myself must be present at all times when students are in the lab.

Course-Related Questions
Questions are encouraged! In addition to asking questions in class, you may also e-mail me at cspenc27@fau.edu or come to office hours with questions. Except weekends and holidays, I will generally answer questions within 48 hours. Please don't hesitate to reach out to me - I'm here to help!

Course Topical Outline

*This outline is subject to change by the instructor and will be updated accordingly during the semester

Crosses for aging studies will be set up at the beginning of the semester, so old flies are available by the start of independent project data collection.

Overview: Mitochondrial turnover is an important component of healthy aging. Senescent (aged) cells display a reduced mitochondrial turnover due to impaired degradation machinery and increased oxidative damage. During this semester, we will assess mitochondrial health in neurons (nSyb-Gal4) and glia (Repo-Gal4) and use the mushroom bodies of the fly as a key landmark of high metabolic demand and interest in aging. The mushroom bodies of the fly brain act as the center for olfactory memory, which has been shown to be impacted by aging and result in some forms of memory impairment. The underlying molecular phenomena for this age-related phenotype have not been fully elucidated, and we aim to understand the link to oxidative stress and mitochondrial health in discrete cell types that support olfactory memory. Our methods will include a genetic marker of mitochondrial health (MitoTimer), and antibodies

against lipid peroxidation (4-HNE) and oxidized DNA (8-OHdG). We will focus our studies on directing these genetic tools/markers to neurons vs glia. We will test adult flies at varying age points- Young (1-5 days AE), Middle-aged (15-20 days AE), and old (45-50 days AE); assess sex differences that may be present in males and females. We will also test late-stage larvae as a baseline "control" for mitochondrial health in the developing mushroom bodies. We plan for results to be compiled and interpreted in a microPublication Biology article with all contributors as co-authors.

Two students will make up each group and contribute equally toward literature analysis, experimental design, data collection/analysis, formal written results, and interpretation.

Projects:

1) **Glia Mitochondrial Health**
    a. Genotype: Repo-Gal4/+; UAS-MitoTimer/+
    b. Ages: Young (1-5 day AE), Middle-aged (15-20 day AE), Old (45-50 day AE) [5 males; 5 females each group]
    c. Staining: Mouse anti-nc82 (1:30) → Goat anti-mouse Alexa Fluor 647 (1:250) (Far Red)
    d. Native: MitoTimer green/red.
2) **Neuron Mitochondrial Health**
    a. Genotype: nSyb-Gal4/UAS-MitoTimer
    b. Ages: Young (1-5 day AE), Middle-aged (15-20 day AE), Old (45-50 day AE) [5 males; 5 females each group]
    c. Staining: Mouse anti-nc82 (1:30) → Alexa Fluor 647 (1:250) (Far Red).
    d. Native: MitoTimer green/red.
3) **Glia/Neuron Lipid Peroxidation**
    a. Genotypes: nSyb-Gal4/UAS-mCD8::GFP and Repo-Gal4/UAS-mCD8::GFP
    b. Ages: Young (1-5 day AE), Middle-aged (15-20 day AE), Old (45-50 day AE) [5 males; 5 females each group]
    c. Staining: Rabbit anti-4-HNE (1:200) → Goat anti-rabbit Alexa Fluor 647 (1:250) (Far Red); Mouse anti-nc82 (1:30) → Goat anti-mouse Alexa Fluor 568 (1:250) (Red) **or** Mouse anti-GFP (1:500) → Goat anti-mouse 488 (1:250) ***Testing needed for each- Likely nc82!***
    d. Native: GFP (Green).
4) **Glia/Neuron DNA Oxidation**
    a. Genotypes: Same as Group 3.
    b. Ages: Young (1-5 day AE), Middle-aged (15-20 day AE), Old (45-50 day AE) [5 males; 5 females each group]

c. Staining: Rabbit anti-8-OHdG (1:200) → Goat anti-rabbit Alexa Fluor 647 (1:250) (Far Red); Mouse anti-nc82 (1:30) → Goat anti-mouse Alexa Fluor 568 (1:250) (Red) **or** Mouse anti-GFP (1:500) → Goat anti-mouse 488 (1:250) ***Testing needed for each- Likely nc82!***
d. Native: GFP (Green).

5) Larval Glia vs Neuron Mitochondrial Health

a. Genotypes: nSyb-Gal4/UAS-MitoTimer and Repo-Gal4/UAS-MitoTimer
b. Stage: 3rd instar larvae [5 males; 5 females for each genotype tested].
c. Staining: Mouse anti-nc82 → Goat anti-mouse Alexa Fluor 647 (Far Red)
d. Native: MitoTimer green/red.

Week #/Day	**Outline**	**To complete before class**
Week 1/Monday, Aug 18	Introduction to the model system and questions at hand (lec)	Review syllabus
Week 1/Friday, Aug 22	Quiz 1; Learning the lab; lab trainings (lec)	Review lecture posted
Week 2/Monday, Aug 25	Fly genetics; Transgene systems (UAS/Gal4); Fly pushing and crosses (lec and lab)	Lab trainings; Read article/annotate (Southall et al 2008)
Week 2/Friday, Aug 29	Quiz 2; Intro to the fly nervous system and neuroanatomy (lec); pinning flies (lab); Dissection videos	Review lecture posted and dissection videos
Week 3/Monday, Sep 1	Labor Day- No Class	
Week 3/Friday, Sep 5	CNS aging and memory; dissecting the brain (lab)	Read article/annotate (Davis 2023), review videos
Week 4/Monday, Sep 8	Quiz 3; dissection (lab)	Review lecture posted
Week 4/Friday, Sep 12	IHC (lec); pipetting (lab)	Read article/annotate (Coutinho et al 2024)
Week 5/Monday, Sep 15	Quiz 4; Confocal microscopy (guest lec); dissection (lab); Image on Nikon A1R	Review lecture posted
Week 5/Friday, Sep 19	Image on the Zeiss LSM (lab)	Read article/annotate (Fei et al 2025)
Week 6/Monday, Sep 22	Quiz 5; Choose projects; set up project crosses; dissection (lab)	Review lecture posted

Week 6/Friday, Sep 26	Dissection; IHC (lab)	Two primary articles due: annotated and summarized
Week 7/Monday, Sep 29	Isolate progeny; tissue clearing/embedding tissues (lab)	
Week 7/Friday, Oct 3	Set up crosses; Confocal imaging (lab)	Email *Project proposal draft* by the end of the day
Week 8/Monday, Oct 6	Lab practical	Review all posted materials and in class notes
Week 8/Friday, Oct 10	Isolate progeny; image analysis (lec/lab)	**Project proposal due** (8 articles per group). *Project summary; Introduction/Justification; Methods part 1; Expected results; Refs*.
Week 9/Monday, Oct 13	Statistical analysis (lec); Dissection; IHC (lab)	
Week 9/Friday, Oct 17	Independent projects (dissection/IHC)	
Week 10/Monday, Oct 20	Independent projects (imaging)	Project methods part 2 due
Week 10/Friday, Oct 24	Independent projects (dissection/IHC)	
Week 11/Monday, Oct 27	Independent projects (imaging)	
Week 11/Friday, Oct 31	Independent projects (dissection/IHC)	Data/statistical analysis pipeline due
Week 12/Monday, Nov 3	Independent projects (imaging)	
Week 12/Friday, Nov 7	Independent projects	Completed data analysis due
Week 13/Monday, Nov 10	Independent projects	Final paper draft 1 due
Week 13/Friday, Nov 14	Independent projects; Backup imaging	Poster draft due- tentative
Week 14/Monday, Nov 17	Practice presentations in class	Final posters due- tentative
Week 14/Friday, Nov 21	Research poster presentations at WHC Fall symposium (formal attire)	*Date likely to be amended*
Week 15/Monday, Nov 24	Lab cleanup/semester review	Final paper due